Digital Darwinism

Robert Mitton

Workstation and Server Marketing

Advanced Micro Devices, Inc.

Survival of the Fittest

- Competition breeds innovation
- Successful innovation born of existing knowledge base and infrastructures

Case in Point: The “Iron Horse”

- Goal: Faster, more efficient transport of people and goods
- Innovation: Locomotive
- knowledge base: Width of carriage wheels
- Successful innovation? Yes!

Darwinism in the Computer Industry

- Goal: Faster, more functional technologies
- Innovation: AMD x86-64 technology
- knowledge base: Instruction sets, software, user experience

What Digital Darwinism Means to You

- **MIS/Users**
  - » Leverage knowledge base and experience
  - » Retain billions of dollars invested in current software, hardware and training
  - » Reduce risk of introducing innovations into the enterprise
- **Developers**
  - » Leverage toolsets, methodologies, years of developed skills
  - » Yield fast returns on effort
  - » Preserve existing customer base

Observations on 64-bit Computing

- **Architecture**
  - New instruction sets require huge investment in skills/development/tools
  - Market needs a long, smooth transition to 64-bits
- **Performance**
  - Instruction sets don't address the major issues
    - » Control flow predictability
    - » Operation latency (especially memory latency)

Ideal solution delivers industry leading performance and seamlessly spans 32- and 64-bit applications

The Innovative Approach: AMD's x86-64 Technology

- **Fully compatible with today's x86 instruction set, an extension to the x86 instruction set**
  - New operands, same operators
  - Same instruction lengths - no code bloat
- **Straight forward approach**
  - 32-bit seamless compatibility
  - Designed to run today's 32-bit OS's and apps with industry-leading performance

AMD's 8th Generation "Hammer" Processors

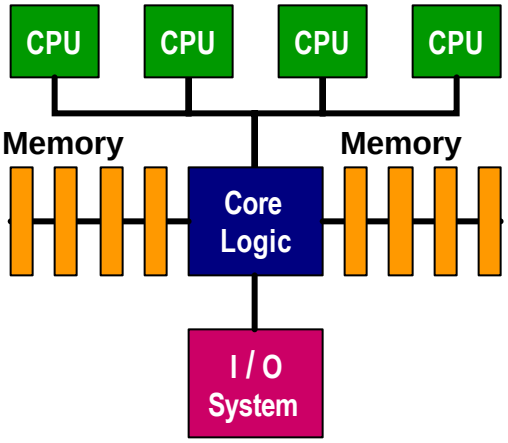
- **Goal: Sustain and increase performance lead**
- **Innovation: Performance = Clock speed x architecture**
  - Architectural performance innovations
  - Pipeline supports aggressive clock speed scaling
- **knowledge base: x86-64, DDR DRAM, LDT**

Lightning Data Transport (LDT)

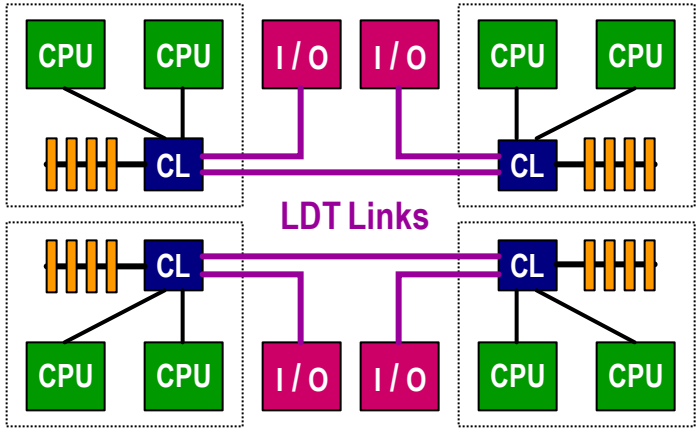
- **Open standard for building high-bandwidth I/O subsystems to help address latency**
  - >1GHz signaling
  - >1GB/s I/O subsystems: PCI-X, Gigabit Ethernet, InfiniBand, etc
- **Innovative new high-speed interconnect builds on existing work**
  - PCI device enumeration and setup methods
  - PnP header already defined
  - LVDS inspired signaling

Highly Scaleable Multiprocessing

Shared Bus Architecture



NUMA Architecture



- **Scalability limits**
  - Shared CPU buses force CPUs to share limited bandwidth
  - More processors --> more memory bandwidth needed
  - More IO bandwidth needed too
- **NUMA Architecture Improves Scaling**
  - NUMA eases memory and I/O bandwidth scaling
  - Coherent LDT, an extension of LDT, supports NUMA architecture

The Better Choice for Enterprise Computing

- **The most straightforward approach to 64-bit computing**
  - Not a major disruption, preserves existing instruction set
  - Familiar methodology for extending architecture
- **Seamless integration with existing environments**
  - Introduces advantages of 64-bit while retaining existing software, tools, drivers, etc.
  - Leverages the knowledge base, toolchain, and billions of dollars invested in existing software
  - Maintains existing support and maintenance procedures

Summary

- Major innovations in the market will be built on existing infrastructure
- Digital Darwinism will eliminate the Dodo birds of technology
- AMD's Hammer family will emerge as a platform leader